

Study on the Development of a Mobile Application for the ease of Communication for Construction Site Management

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Abstract: The Effective communication throughout the project participants in construction sites is a major factor for construction projects management. The efficiency of project are improved by a speedy delivery of these projects datas, this paper presents the development of a mobile application system to support construction site management and communication. The developed mobile application is designed to improve communication between Manager, field office staff, and mobile users. at the construction sites. The mobile application specifications provides users with valuable features such as, receive instructions from site, send requests for interpretations and retrieve information about projects. The developed system is tested first on emulators and then on Android devices. After that the system was tested on a highway improvement project or any construction projects. Through their mobile phone application, site users are able to interact with field office and home office personnel who use the web application to searching the information about the project for clarification. It is expected that this work will contribute to facilitate communication and management in construction sites, which is much needed in this information.

Keywords: Mobile application ; Construction communication; Construction management; Construction site ; Construction information.

I. Introduction

Basically the construction projects has nature of present unique communications challenges among project participants. These challenges can be plays the major role in the massive amount of information that needs to be transferred and exchanged during the construction process of projects as it is well known that construction is an information intensive industry The information dispersion of project teams and construction activities are made the frequent changes of work site locations. The nature of the industry that engage many different stakeholders from the owner, consultants, bankers besides contractors, subcontractors and suppliers are frequent factors that are affect the information system. The separation between site offices and work sites . The requirements and need of timely transfer of information as the construction industry is characterized by deadlines and costly delays. The increased communication on subcontractors to perform construction site work as it was reported that at least 78% of the activities performed on a construction site is subcontracted to specialty contractors which in turn to the deep broken communication of the industry.

II. Inter Disciplinary

Despite the perceived benefits of IT adoption in the construction industry, the industry is making insufficient use of transferring project data and information electronically. As previously reported, comment that data exchange between project participants are still largely undertaken on paper. Furthermore, the construction industry has been identified as not having a coherent and integrated computer system that encompasses the whole of the construction process from design through construction to final account and facilities management, even though the existing technology can make this possible. IT is viewed as a means of solving communication and information management challenges. Once an information system (IS) is implemented opportunities are created for the internal process to improve. Technology implemented at operational level impacts on the development and use of IT at project and organization level.

- There is a lot of technologies available in construction but still now there is lot of communication problem and problems arrived in transfer of reports.
- Hence here we have combine with the IT department.
- Based on the need and requirements I will create the mobile application with the support of computer science department hence it is known as inter disciplinary.

III. Objective

The aim of the paper is to improve the communication in facilitating the use of mobile technologies for the design, management and construction of building and civil construction projects. It aims to identify and implement appropriate communication and information technology solutions that improve material and labour management, support and improve total project life considerations, increase efficiencies on construction projects, Reduce the cost and improve project result to project in the public and private sectors.

- To use the communication and information technologies in the construction industry.
- To achieve the effective communication and site management among the project by mobile application.
- To completing the work within specified time and budget.
- To creating an organization that work as team by proper work tasking to every employees.

A. Advantages

The IT application in construction industry has the following advantages in construction management.

- Improved efficiency in project and contract management.
- Better project control.
- Improved coordination of project operation.
- Faster reporting.
- Better decision making.
- Better availability of information for project participants.
- Improved communication.
- Storage of project information in one location, thus promoting improved management of project knowledge and laying the platform for integrated life cycle project development and management.
- Improved contractual relationships as the result of better communication.

IV. Construction Industry

Communication Challenges

Achieving effective communication and documentation is essential if the construction industry is to achieve the level of efficiency that is taken for granted in other industries. Communication between project team members and the client is made easier if the lines of authority are well defined. That is, where formal communication lines and a positive working environment enhance informal communication within the project team and therefore contribute to the success of the project. The key benefit from introducing new information technology tools into the construction industry, as identified is the ability to communicate across the different shareholders of the project, where digital data is fast becoming the 'de-facto' media for the exchange of ideas and comments.

Communicating across different stakeholders while essential is not without difficulties, for example, report that communication techniques/tools pertaining to building maintenance information, transferred between technical and nontechnical staff, were found to be problematic. One of the main problems encountered in transferring technical information between project stakeholders was the difference in backgrounds of the parties involved. Communication tools that incorporate visual aids were found beneficial when trying to clarify matters at hand.

The examined communication and information flows between contractors and construction industry professionals found that:

- Rework is a result of poor communication.
- IT had improved the communication processes between project participants.
- The construction industry relies heavily on informal communication, which is considered reliable by project participants.
- Fax machines are used to transfer information to project participants.
- IT applications, that is, desk-top computers and mobile phones, are widely used.

A. Lack of understanding

Where inexperienced clients do not fully understand the sketch plans and drawings that are developed during the briefing and design stages. This misunderstanding of the contract documents will therefore not fully represent the client's needs or expectations of the final product. The misunderstanding of interpreting contract

documents between the designers and draftsmen, as well as between the workers on construction sites is another very common occurrence.

B. Lack of co-ordination

Clashes between services and/or structures are often designed and documented without considering the needs of the various services. This is due to:

- The number & variety of disciplines involved in the design process;
- Their conflicting needs; and
- The labour intensive processes currently used to co-ordinate the output of the various disciplines.

C. Discrepancies

Delay costs during construction can escalate dramatically while discrepancies between information are being resolved due to conflicting requirements or lack of information between the specification and the drawing.

D. Failure to consider the building process

Detail design aspects need to be re-worked on site due to the construction/building inexperience of designers. This leads to interruptions and delays, causing costs to escalate dramatically. Effective feedback to designers about problems and their causes needs to be implemented to minimise these delays. Poor management of construction documents, variations, requests for information and site instructions cause many issues to be forgotten and/or ignored. The lost of information are shown in (fig 1).

E. Improving project communications through information technology

The incentives for adopting and integrating a wide range of electronic documentation solutions are significant in relation to below. The improvement of IT & communication are given below.

- The current affordability and capability of technical solutions.
- The increasing availability of open platform solutions.
- The increased demand for quality assurance practices.
- The increasing need for document management systems.
- The need for efficient methods of document storage.
- The ongoing request for the reduction of paper usage.

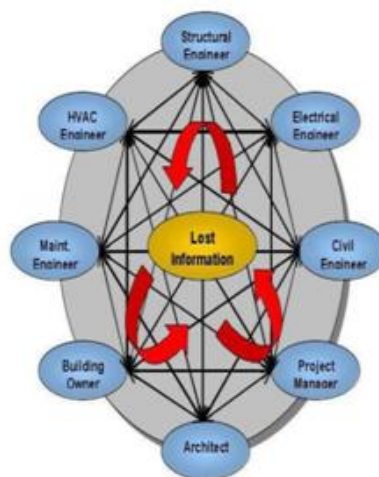


Fig.1 The lost of information

V. Methodology

The methodology for this paper used both a qualitative and quantitative approaches in the project. The qualitative methods used include interviews with project managers, superintendents, and quality control managers with three construction companies that actively use mobile technology.

The project methodology was given in (fig 2).



Fig. 2 The methodology of the project

VI. Literature Review

Literatures collected for this present project investigation of the mobile app development for construction site management is presented below.

Chen, Y. and et all (2008) This paper determine the Effective communication among project participants in construction sites is a real dilemma for construction projects productivity. He was created the mobile device software to improve the construction site communications “MOSIC”.

- He was surveyed the current state of wireless information technology in the construction industry and reported that the level of interest in IT is much higher than the level of use.
- He was created the app with site management module and a construction drawing sharing module.
- Site communication
- Work progress
- Effective management

Beyh, S. and et all.,(2008) Ever improving smart phones and mobile computing technologies provide engineers unprecedented opportunities to innovate the existing processes of construction projects. He was concentrated in Site supervisors control labour with the use of time sheets.

Planning and organizing activities are essential functions applied to achieving goals.

- He created the software which contains the production process involves the effective management of resources such as plant and equipment, materials, transportation, personnel, finance, technology and information.
- Site supervising
- Labour control

Kajewski, S., et al., (2009) This paper present about the Construction engineers are interested in improving site information exchange for enhancing productivity of the construction project. Here they considering the Quality standards are achieved by implementing a quality system that includes, skilled operatives with experience, materials to correct specification, correct storage of materials, effective planning and programming of resources; supervision and inspection by site management, and adequate protection of completed work.

- They are creating the computer software which mainly focusing on the quality and quantity of the material in construction.
- Quality
- Quantity
- Material maintenance

Yang, J., Ahuja, V., (2013) There are many studies of the construction sector, which is increasingly becoming theoretically and empirically important. There is a wide range of literature concerning various areas of industrial applications. The body of literature on the construction sector is very diverse, but it is contingent in the explanation of characteristics and importance.

- Here they considering the effective communication among project participants in construction sites is a real dilemma for construction projects productivity.
- They create the mobile application to improve the efficiency of participants in construction projects and have a speedy delivery of these projects. It contains,
 - Register
 - Login/logout
 - Add/edit project
 - Allocation of work
 - Report preparation

VII. System Implementation

To use the interactive construction site management system, the user has to log on to the mobile platform using his or her own account ID and password. After the successful log-on, the user can access the site management module and the construction sharing report module.

a)

Table - Functional options in the application

Functional Requirement	Characters Involved
Register in the system	Mobile User
Login/Logout	All Users
Add Projects	Home office employee
Modify Projects	Field office employee
Delete Projects	Home office employee
Add Reports	Mobile User
View Projects	Home office employee
View Projects Location	Home office employee
View Activity Location	Mobile user, Field office employee
Capture Pictures	Mobile User
Send PDF Reports	Mobile User

A. Register Work Task

The initial step of using the construction management module is registration of work tasks of management. Engineers can input various work task information, such as task title, description of project, start and end date of the work task, the crew in charge, the supervisor, and the location of the work tasks on the construction site. Once the registration is finished, the information is transferred to the main server via a wireless local area network (WLAN) or a WCDMA network for mobile the process where the construction manager specifies the engineer who should handle the registered work task. The registration work is shown in (fig 3).

B. Work Task Scheduling

According to the registered start/end date of the work task, the work task is scheduled on the calendar of the mobile device. Through this function of the system, the construction engineers on site can easily identify the priority of the work tasks based on the list of the calendar. The work task scheduling is shown in (fig 4).



Fig. 4 work task

C. Locate Work Tasks on the Map

The design may presenting the location of the work site on the map of the mobile device. This feature of the system may offers an effective way to find the location of the work tasks on the construction site. From the identifying current location information of the construction engineers, the engineers on the construction site can deduce the direction and distance to the work tasks on the site. Here the location of the site can identified by the location finding option. The location map is shown in (fig 5).



Fig 5. Location map

D. AR Visualization of Work Task

The design also has a system of AR visualization of the work tasks. The technology of AR has more visualization capability than the display on the map, therefore, the construction engineers can save time and efforts to search work tasks on the construction site. The sample digital report is shown in (fig 6).



Fig 6. Digital report

VIII. Conclusion

The construction industry is deals with the vast amount that should be exchanged between spatially dispersed project participants. The development of mobile application will create the proper exchange of information. In this paper, the development of a mobile application system is presented, which supports collaboration between mobile users at construction sites and other project participants at the field offices as well as management at the home office. The developed mobile application will be developed as a native mobile application for Google's android mobile devices, and therefore it is currently usable by mobile users holding android devices.

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